

## **SUMMARY**

BHP Billiton (BHP) and EPA Region IX (EPA) are currently assessing the impacts of the proposed Cabrillo Port Offshore LNG Import Terminal (Cabrillo Port). An ambient air impacts analysis was submitted as part of the December 30, 2003 permit application. However, since that time BHP has further refined the project design and emissions estimates<sup>1</sup>. In addition, EPA and BHP have discussed the applicability of the Ventura County Air Pollution Control District (District) new source permitting regulations to Cabrillo Port. The following modeling analysis was prepared to update the ambient air impacts analysis to reflect the new emission rates and discussions with EPA.

The modeling analysis is based on predicted maximum Cabrillo Port emissions. NO<sub>2</sub>, SO<sub>2</sub>, CO and PM<sub>10</sub>/PM<sub>2.5</sub> emissions from the stationary source (including the boats in District waters) were modeled using the EPA-approved Offshore and Coastal Dispersion (OCD) Model. Worst case impacts were determined at both onshore and offshore receptors. Ambient impacts at the worst case receptor for each pollutant were below the federal significance thresholds. For example, NO<sub>2</sub> and PM<sub>10</sub> levels at the worst case on-shore receptor are expected to be only 1 percent of the applicable significance thresholds. Based upon this modeling, Cabrillo Port will not materially impact onshore air quality and will not cause or contribute to on-shore ambient air quality standard violations.

## **1.0 AIR QUALITY IMPACT ANALYSIS**

### **1.1 AIR QUALITY MODELING METHODOLOGY**

As for the original air quality impact analysis performed for the project in the PSD permit application, this update to the air quality impact analysis used the OCD Model. As in the previous modeling analysis, the offshore meteorological data used by the model was collected during 1991-1993 by the National Oceanic and Atmospheric Administration (NOAA) at Buoy Station 46025 – Santa Monica Basin. No changes to the model or meteorological data were made.

### **1.2 PROJECT EMISSIONS**

Initial estimates of the Project's emissions were included in the December 2003 application. Since that time, BHP has revised downward the estimated emissions attributable to certain of the sources as the result of utilization of equipment that will meet the 2008 Tier 2 diesel emission standards. In addition, the stationary source emissions also were revised to include LNG-fueled support vessel operations in District waters. Revised project emissions will be submitted to EPA under separate cover. The revised emission rates were utilized in this air

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<sup>1</sup> Revised emissions estimates will be submitted under separate cover.

quality impact analysis. Table 1-1 below summarizes the revised emissions from the sources located on the FSRU and from vessel operations in District waters.

**Table 1-1  
Cabrillo Port Operational Emissions Summary**

Description	Emissions, tons per year				
	NO <sub>x</sub>	ROC	CO	SO <sub>2</sub>	PM <sub>10</sub> /PM <sub>2.5</sub> <sup>a</sup>
<b>Stationary Source (FSRU)</b>					
Wartsila 9L50DF Main Generators	13.1	24.6	29.5	0.1	7.4
Wartsila 9L50DF Backup Generators	5.1	0.7	3.2	<0.1	0.2
Submerged Combustion Vaporizers	48.9	3.5	148.9	0.3	3.8
Emergency Fire Pump and Generator	3.0	0.4	1.8	<0.1	0.1
Freefall Lifeboat	<0.1	<0.1	<0.1	<0.1	<0.1
Diesel Fuel Storage Tank	-0-	<0.1	-0-	-0-	-0-
<b>Total Stationary Source</b>	<b>70.1</b>	<b>29.3</b>	<b>183.5</b>	<b>0.4</b>	<b>11.5</b>
<b>Marine Vessels, District Waters<sup>b</sup></b>					
Tug Supply Boats	0.7	0.1	0.5	<0.1	<0.1
Crew Boat	0.4	<0.1	0.3	<0.1	<0.1
<b>Subtotal, District Waters</b>	<b>1.2</b>	<b>0.2</b>	<b>0.8</b>	<b>&lt;0.1</b>	<b>&lt;0.1</b>
<b>Total Project Emissions</b>	<b>71.3</b>	<b>29.5</b>	<b>184.3</b>	<b>0.4</b>	<b>11.5</b>

Notes:

a. All PM<sub>10</sub> assumed to be PM<sub>2.5</sub>.

b. District waters extend approximately 3.5 miles from shoreline.

The activity data on which these emissions calculations are based are being provided to the agencies by the applicant under separate cover. This activity data was also the basis for calculation of emissions over shorter periods to allow comparison of modeled impacts with short-term ambient air quality standards. The emission rates used in the modeling analysis are shown in the appendix.

### 1.3 AIR QUALITY IMPACT ANALYSIS

#### 1.3.1 Receptor Locations

The overwater receptor grid extended approximately 25 miles up and down the coast from the FSRU. The overland receptor grid extended two miles inland from the shoreline with additional receptors in the Oxnard area.

Receptors have been excluded from a 500 meter exclusion zone surrounding the FSRU. Under Federal law (33 CFR 165.2 Subpart C, Safety Zones), a safety

zone is an area “to which for safety or environmental purposes, access is limited to authorized persons, vehicles, or vessels. It may be stationary and described by fixed limits or it may be described as a zone around a vessel in motion.” The Applicant has requested from the U.S. Coast Guard a safety zone with a radius of 500 meters from the outer edge of the FSRU. If the project is approved, the safety zone will be added to navigation charts as a limited access area only, established in accordance with 33 CFR Part 150. Only LNG carriers bound for the FSRU and service and supply vessels associated with the FSRU and LNG carrier operations would be allowed to enter the safety zone. By federal law, the general public would no longer have access to this area. The safety zone would be rigorously patrolled to prevent the incursion of unauthorized personnel.

This exclusion is consistent with the December 19, 1980, letter from Douglas Costle to Senator Jennings Randolph stating that an “exemption from ambient air is available only for the atmosphere over land owned or controlled by the source and to which public access is precluded by a fence or other physical barriers.” This exemption was further clarified in an April 30, 1987, letter from G.T. Helms of OAQPS to Steve Rothblatt, Chief of the Region V Air Division, stating that receptors must be placed in a river that is a public waterway because it is not controlled by the source. However, the letter also lays out the conditions under which the adjacent riverbank may be excluded from ambient air: “[t]he riverbank must be clearly posted and regularly patrolled by plant security. It must be very clear that the area is not public.” Because the safety zone is an area that will be controlled by the source, clearly posted on navigational charts and rigorously patrolled, the general public will not have access to the area and the safety zone is not considered to be ambient air. This approach is consistent with the way in which EPA Region 6 handled the safety zone for the El Paso Energy Bridge (now, Gulf Gateway Energy Bridge). In that situation EPA recognized that the general public is excluded from the safety zone and so the area within the safety zone does not meet the definition of “ambient air.”

### 1.3.2 Results of the Air Quality Impact Analysis

Results of the air quality modeling analysis are summarized in Tables 1-2 through 1-5. Tables 1-2 and 1-3 compare the maximum modeled concentrations from project emissions to the PSD significance thresholds and Class II increments. Stationary source impacts and stationary source plus marine vessel impacts are shown separately. Table 1-2 shows that the maximum modeled impacts of the stationary sources alone, which occur within approximately half a kilometer of the FSRU, will be below the PSD significance thresholds for all pollutants and averaging times. Table 1-3 shows that the inclusion in the air quality impact analysis of marine vessel activity in District waters has very little impact on the modeled impacts from the proposed project. Because the support vessels operate infrequently and for short periods of time in District waters, their emissions affect maximum modeled impacts only for the one- and eight-hour averaging period. Impacts for longer averaging periods are unaffected. Eight-hour NO<sub>x</sub> concentrations are presented in lieu of ozone modeling; this issue is discussed in greater detail below.

Tables 1-4 and 1-5 show, for stationary sources and all sources, respectively, the maximum modeled onshore impacts from the project combined with representative background pollutant concentrations, and compares these total projected impacts with the federal ambient air quality standards. Background concentrations are the same as those presented in the original PSD application. These results show that emissions from the proposed FSRU would not cause or contribute to any violations of any federal ambient air quality standard. EPA has stated that it is its longstanding policy to use significant impact levels to determine whether a proposed new or modified source will cause or contribute to a violation of the national ambient air quality standards (NAAQS) or PSD increments. If a source's maximum impacts are below the significant impact levels, then the source is judged to not cause or contribute to a NAAQS or increment violation. As the Project is significantly below the significant impact level for each pollutant, it will not cause or contribute to a NAAQS or increment violation.

The District consists of both attainment areas and a nonattainment area. Anacapa Island and San Nicolas Island are within the District boundaries and are designated as attainment for all federal standards. The portion of the County on the mainland is designated as a nonattainment area for ozone and as an attainment area for all other federal standards. The Project is essentially the same distance from Anacapa Island as the mainland. In Figures 1-7 through 1-9 it can be seen that the impacts to Anacapa Island from the combined FSRU source and marine vessel emissions are less than or equal to the impacts on the mainland for all pollutants. Therefore, this report focuses on impacts to the mainland.

**Table 1-2**  
**Comparison of Maximum Modeled Stationary Source Impacts with PSD Significance Thresholds and Class II Increments**

Pollutant	Avg Period	Max. Modeled Offshore Impact ( $\mu\text{g}/\text{m}^3$ )	Max. Modeled Onshore Impact ( $\mu\text{g}/\text{m}^3$ )	PSD Significance Threshold ( $\mu\text{g}/\text{m}^3$ )	PSD Class II Increment ( $\mu\text{g}/\text{m}^3$ )	Maximum Impact Distance (m)	
						From FSRU	From Shoreline
NO <sub>2</sub> <sup>a</sup>	8-hour	12.3	0.63	--	--	730	23,400
	annual	1.0	0.01	1.0	25	920	23,340
SO <sub>2</sub>	3-hour	0.1	<0.01	25	325	730	22,720
	24-hour	0.05	<0.01	5	91	820	23,370
	annual	0.01	<0.01	1.0	20	920	23,340
CO	1-hour	49.4	9.1	2,000	--	890	23,560
	8-hour	37.6	1.8	500	--	730	23,400
PM <sub>10</sub> /PM <sub>2.5</sub>	24-hour	0.6	0.05	5	30	820	23,370
	annual	0.1	<0.01	1.0	17	920	23,340

Note: a. 8-hr average NO<sub>2</sub> concentration is modeled for use in estimating project ozone impacts.

**Table 1-3**  
**Comparison of Maximum Modeled Project Impacts with PSD Significance Thresholds and Class II Increments (Stationary Sources and Marine Vessels)**

Pollutant	Avg Period	Max. Modeled Offshore Impact ( $\mu\text{g}/\text{m}^3$ )	Max. Modeled Onshore Impact ( $\mu\text{g}/\text{m}^3$ )	PSD Significance Threshold ( $\mu\text{g}/\text{m}^3$ )	PSD Class II Increment ( $\mu\text{g}/\text{m}^3$ )	Maximum Impact Distance (m)	
						From FSRU	From Shoreline
NO <sub>2</sub> <sup>a</sup>	8-hour	12.3	1.5	--	--	730	23,400
	annual	1.0	0.01	1.0	25	920	23,340
SO <sub>2</sub>	3-hour	0.1	0.01	25	325	730	22,720
	24-hour	0.05	<0.01	5	91	820	23,370
	annual	0.01	<0.01	1.0	20	920	23,340
CO	1-hour	49.5	12.5	2,000	--	630	23,940
	8-hour	37.6	1.8	500	--	730	23,400
PM <sub>10</sub> /PM <sub>2.5</sub>	24-hour	0.6	0.05	5	30	820	23,370
	annual	0.1	<0.01	1.0	17	920	23,340

a. 8-hr average NO<sub>2</sub> concentration is modeled for use in estimating project ozone impacts.

**Table 1-4**  
**Comparison of Maximum Modeled Onshore Stationary Source Impacts with Ambient Air Quality Standards**

Pollutant	Avg Period	Max. Modeled Onshore Impact ( $\mu\text{g}/\text{m}^3$ )	Background Conc. <sup>a</sup> ( $\mu\text{g}/\text{m}^3$ )	Total Impact ( $\mu\text{g}/\text{m}^3$ )	Federal Standard ( $\mu\text{g}/\text{m}^3$ )
NO <sub>2</sub>	annual	0.01	26	26	100
SO <sub>2</sub>	3-hour	<0.01	39	39	1,300
	24-hour	<0.01	31	31	365
	annual	<0.01	10	10	80
CO	1-hour	9.1	8,469	8,478	40,000
	8-hour	1.8	4,921	4,923	10,000
PM <sub>10</sub>	24-hour	0.05	124	124	150
	annual	<0.01	31	31	50
PM <sub>2.5</sub>	24-hour	0.05	32 <sup>b</sup>	32	65
	annual	<0.01	13	13	15

a. Background values for NO<sub>2</sub>, SO<sub>2</sub>, PM<sub>10</sub> and PM<sub>2.5</sub> from El Rio monitoring station (Station ID No. 061113001). Background values for CO from Ventura-Emma Wood State Beach monitoring station (Station ID No. 061112003).

b. Background values for PM<sub>2.5</sub> based on 98<sup>th</sup> percentile.

**Table 1-5**  
**Comparison of Maximum Modeled Project Onshore Impacts with Ambient Air Quality Standards**  
**(Stationary Sources and Marine Vessels)**

Pollutant	Avg Period	Max. Modeled		Total Impact ( $\mu\text{g}/\text{m}^3$ )	Federal Standard ( $\mu\text{g}/\text{m}^3$ )
		Onshore Impact ( $\mu\text{g}/\text{m}^3$ )	Background Conc. <sup>a</sup> ( $\mu\text{g}/\text{m}^3$ )		
NO <sub>2</sub>	Annual	0.01	26	26	100
SO <sub>2</sub>	3-hour	0.01	39	39	1,300
	24-hour	<0.01	31	31	365
	Annual	<0.01	10	10	80
CO	1-hour	12.5	8,469	8,482	40,000
	8-hour	1.8	4,921	4,923	10,000
PM <sub>10</sub>	24-hour	0.05	124	124	150
	Annual	<0.01	31	31	50
PM <sub>2.5</sub>	24-hour	0.05	32 <sup>b</sup>	32	65
	Annual	<0.01	13	13	15

a. Background values for NO<sub>2</sub>, SO<sub>2</sub>, PM<sub>10</sub> and PM<sub>2.5</sub> from El Rio monitoring station (Station ID No. 061113001). Background values for CO from Ventura-Emma Wood State Beach monitoring station (Station ID No. 061112003).  
b. Background values for PM<sub>2.5</sub> based on 98<sup>th</sup> percentile.

Tables 1-2 and 1-3 show that the maximum project impacts for all pollutants and averaging periods occur at sea, and, except for one-hour average CO impacts, outside District waters. Modeled impacts for all pollutants and averaging periods are much lower onshore. Figures 1-1 through 1-3 and 1-7 through 1-9 show the modeled impacts of annual NO<sub>x</sub> and 24-hour and annual PM<sub>10</sub>/PM<sub>2.5</sub> from the stationary sources on the FSRU alone and from the FSRU sources and the associated marine vessel activity in the vicinity of the project, respectively. Figures 1-4 through 1-6 and 1-10 through 1-12 show the onshore impacts for NO<sub>x</sub> and PM<sub>10</sub>/PM<sub>2.5</sub> for the FSRU sources alone and in combination with the marine vessels in greater detail.

## **2 ASSESSMENT OF SIGNIFICANCE**

### **2.1 SIGNIFICANCE COMPARISON TABLES**

In the following tables, the maximum onshore ambient air quality impacts of the Cabrillo Port LNG facility are compared with the relevant concentration-based significance criteria for each pollutant.

#### **2.1.1 Nitrogen Dioxide**

Table 2.1 compares the onshore NO<sub>x</sub> emission impacts from the proposed Project with the ambient air quality standards and the Class I and Class II significant impact levels for NO<sub>x</sub>. EPA specifies that a major source will not be considered to cause or contribute to a violation of a national ambient air quality standard if the ambient impacts attributable to that major source are less than or

equal to the Class II significance levels at any locality that does not or would not meet the applicable national standard. 40 CFR § 51.165(b)(2). Ventura County, in its entirety, is an attainment area for the federal NO<sub>2</sub> standard. Impacts below the significant impact levels demonstrate that the Project will have inconsequential impacts to onshore air quality.

Comparison of the modeling results at the worst case receptors to the significant impact levels indicates that the Project will not have a material effect upon air quality. None of the impact levels exceed the Class II NO<sub>2</sub> significance level of 1.0 µg/m<sup>3</sup>; maximum predicted impacts are approximately two orders of magnitude below that threshold. Therefore, the facility is not expected to cause or contribute to an on-shore violation of the NO<sub>2</sub> ambient air quality standard.

**Table 2-1**  
**Assessment of Significance for Onshore Impacts of Oxides of Nitrogen**

Measure of Significance	Level	Concentration	
		Stationary Sources	Stationary Sources and Marine Vessels
National AAQS	100 µg/m <sup>3</sup>	0.01	0.01
Class II SIL	1.0 µg/m <sup>3</sup>	0.01	0.01
Class II increment	25 µg/m <sup>3</sup>	0.01	0.01
Class I SIL	0.1 µg/m <sup>3</sup>	0.01	0.01
Class I increment	2.5 µg/m <sup>3</sup>	0.01	0.01

### 2.1.2 Ozone

There are no approved air quality models for evaluating the ozone impacts of an individual project. However, the OCD modeling results and the unique attributes of the proposed Project demonstrate that there is insignificant potential for the proposed Project to impact the onshore ozone nonattainment area.

The proposed Project's onshore NO<sub>2</sub> impacts are too small to materially contribute to ozone formation. The proposed Project's annual NO<sub>2</sub> impacts are approximately two orders of magnitude below the Class II significant impact level. The proposed Project's short term worst case onshore NO<sub>2</sub> impact would be approximately 1.5 µg/m<sup>3</sup> (8-hour average).

Based upon the minimal NO<sub>2</sub> impacts that will be experienced at the shoreline, the proposed Project is not expected to cause or materially contribute to any onshore violation of the ozone standard.

### 2.1.2 Carbon Monoxide

Table 2-2 compares the CO emission impacts from the proposed project with the ambient air quality standards and the Class II significant impact levels. EPA specifies that a major source will be considered to cause or contribute to a violation of a national ambient air quality standard if the ambient impacts attributable to that major source exceed the Class II significance levels at any locality that does not or would not meet the applicable national standard. 40 CFR § 51.165(b)(2). Ventura County, in its entirety, is an attainment area for the federal CO standards. Impacts below the significant impact levels demonstrate that the Project will have inconsequential impacts to onshore air quality.

A comparison of the modeling results at the worst case receptors to the significant impact levels indicates that the Project will not have a material effect upon air quality. None of the impact levels exceed the CO significance levels of 500 µg/m<sup>3</sup> (8 hour average) or 2,000 µg/m<sup>3</sup> (1 hour average). Therefore, the facility is not expected to cause or contribute to any on-shore violation of the CO ambient air quality standard.

**Table 2-2**  
**Assessment of Significance for Onshore Impacts of Carbon Monoxide**

Measure of Significance	Level	Concentration	
		Stationary Sources	Stationary Sources and Marine Vessels
National AAQS – 1 hr	40,000 µg/m <sup>3</sup>	9.1	12.5
National AAQS – 8 hr	10,000 µg/m <sup>3</sup>	1.8	1.8
Class II SIL – 1 hr	2,000 µg/m <sup>3</sup>	9.1	12.5
Class II SIL – 8 hr	500 µg/m <sup>3</sup>	1.8	1.8

### 2.1.3 Sulfur Dioxide

Table 2-3 compares the modeled SO<sub>2</sub> emission impacts from the proposed Project to the ambient air quality standards and the Class I and Class II significant impact levels. EPA specifies that a major source will be considered to cause or contribute to a violation of a national ambient air quality standard if the ambient impacts attributable to that major source exceed the Class II significance levels at any locality that does not or would not meet the applicable national standard. 40 CFR § 51.165(b)(2). Ventura County, in its entirety, is an attainment area for the federal SO<sub>2</sub> standards. Impacts below the significant impact levels demonstrate that the Project will have inconsequential impacts to onshore air quality.

A comparison of the modeling results at the worst case receptors to the significant impact levels indicates that the Project will not have a material effect upon air quality. None of the impact levels exceed the Class II SO<sub>2</sub> significance levels of 1 µg/m<sup>3</sup> (annual average), 5 µg/m<sup>3</sup> (24 hour average) or 25 µg/m<sup>3</sup> (3



hour average). Therefore, the facility is not expected to cause or contribute to any on-shore violation of the SO<sub>2</sub> ambient air quality standard.

**Table 2-3**  
**Assessment of Significance for Onshore Impacts of Sulfur Dioxide**

Measure of Significance	Level	Concentration	
		Stationary Sources	Stationary Sources and Marine Vessels
National AAQS – 3 hr	1300 µg/m <sup>3</sup>	<0.01	0.01
National AAQS – 24 hr	365 µg/m <sup>3</sup>	<0.01	<0.01
National AAQS - annual	80 µg/m <sup>3</sup>	<0.01	<0.01
Class II SIL – 3 hr	25 µg/m <sup>3</sup>	<0.01	0.01
Class II SIL - 24 hr	5 µg/m <sup>3</sup>	<0.01	<0.01
Class II SIL - annual	1.0 µg/m <sup>3</sup>	<0.01	<0.01
Class I SIL - 3 hr	1.0 µg/m <sup>3</sup>	<0.01	0.01
Class I SIL - 24 hr	0.2 µg/m <sup>3</sup>	<0.01	<0.01
Class I SIL - annual	0.1 µg/m <sup>3</sup>	<0.01	<0.01

#### 2.1.4 Fine Particulates

Table 2-4 compares the ambient PM<sub>10</sub> emission impacts from the proposed Project to the ambient air quality standards and the Class I and Class II significant impact levels. EPA specifies that a major source will be considered to cause or contribute to a violation of a national ambient air quality standard if the ambient impacts attributable to that major source exceed the Class II significance levels at any locality that does not or would not meet the applicable national standard. 40 CFR § 51.165(b)(2). Ventura County, in its entirety, is an attainment area for the federal PM<sub>10</sub> and PM<sub>2.5</sub> standards. Impacts below the significant impact levels demonstrate that the Project will have inconsequential impacts to onshore air quality.

A comparison of the modeling results at the worst case receptors to the significant impact levels indicates that the Project will not have a material effect upon air quality. None of the impact levels exceed the Class II PM<sub>10</sub> significance levels of 1 µg/m<sup>3</sup> (annual average) or 5 µg/m<sup>3</sup> (24 hour average). While significance levels have yet to be developed for PM<sub>2.5</sub>, the combination of onshore attainment status and the extremely low ambient impacts indicate that the proposed Project will have an insignificant effect upon air quality. Therefore, the facility is not expected to cause or contribute to any on-shore violation of the PM<sub>10</sub> or PM<sub>2.5</sub> ambient air quality standards.

**Table 2-4**  
**Assessment of Significance for Onshore Impacts of Fine Particulates (PM<sub>10</sub>)**

Measure of Significance	Level	Concentration	
		Stationary Sources	Stationary Sources and Marine Vessels
National AAQS - 24 hr	150 µg/m <sup>3</sup>	0.05	0.05
National AAQS - annual	50 µg/m <sup>3</sup>	<0.01	<0.01
Class II SIL - 24 hr	5 µg/m <sup>3</sup>	0.05	0.05
Class II SIL - annual	1 µg/m <sup>3</sup>	<0.01	<0.01
Class I SIL - 24 hr	0.3 µg/m <sup>3</sup>	0.05	0.05
Class I SIL - annual	0.2 µg/m <sup>3</sup>	<0.01	<0.01

**Table 2-5**  
**Assessment of Significance for Onshore Impacts of Fine Particulates (PM<sub>2.5</sub>)**

Measure of Significance	Level	Concentration	
		Stationary Sources	Stationary Sources and Marine Vessels
National AAQS - 24 hr	65 µg/m <sup>3</sup>	0.05	0.05
National AAQS - annual	15 µg/m <sup>3</sup>	<0.01	<0.01

## 2.2 Ambient Air Quality Impacts

As shown in the modeling results presented in Section 1, the ambient impacts attributable to the proposed Project are expected to be less than the significant impact levels at the worst case receptors, and lower still onshore. As a result, the operation of the proposed Project will not cause or contribute to exceedances of the NAAQS for any pollutant. Accordingly, the Cabrillo LNG facility will not have a material impact on onshore ambient air quality.

## 2.3 Overall Assessment of Significance

The analysis of impacts on air quality on and offshore within 22 miles of the facility shows that the operation of the LNG terminal facility will not cause or contribute to violations of the NAAQS. Further, these impacts are not considered to be significant when compared with relevant measures of significance.

## **APPENDIX 1**

### **EMISSION RATES AND STACK PARAMETERS FOR MODELING**